AMENDMENTS TO THE DRAWINGS

There are no amendments to the drawings at this time.

REMARKS

STATUS OF THE PENDING CLAIMS

Claims 1 -15 are presently pending.

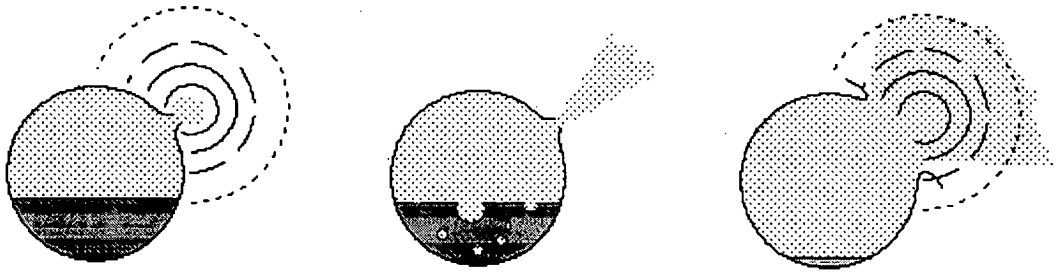
THE PRESENT INVENTION

The present invention relates to BLEVE (boiling liquid, expanding vapor) explosions. Such explosions may be described as follows:

> **BLEVE** (pronounced /ˈ blɛ vi/ *BLEV-ee*), is an acronym for
>
> **boiling liquid expanding vapor explosion**. This is a type of explosion that can occur when a vessel containing a pressurized liquid is ruptured. Such explosions can be extremely hazardous.
>
> A BLEVE results from the rupture of a vessel containing a liquid substantially above its atmospheric boiling point. The substance is stored partly in liquid form, with a gaseous vapour above the liquid filling the remainder of the container.
>
> If the vessel is ruptured — for example, due to corrosion, or failure under pressure — the vapour portion may rapidly leak, lowering the pressure inside the container. This sudden drop in pressure inside the container causes violent boiling of the liquid, which rapidly liberates large amounts of vapour. The pressure of this vapour can be extremely high, causing a significant wave of

overpressure (an explosion) which may completely destroy the storage vessel and project fragments over the surrounding area.

BLEVEs can also be caused by an external fire near the storage vessel causing heating of the contents and pressure build-up. While tanks are often designed to withstand great pressure, constant heating can cause the metal to weaken and eventually fail. If the tank is being heated in an area where there is no liquid, it may rupture faster without the liquid to absorb the heat. Gas containers are usually equipped with relief valves that vent off excess pressure, but the tank can still fail if the pressure is not released quickly enough.



A BLEVE can occur even with a non-flammable substance such as water[1], liquid nitrogen, liquid helium or other refrigerants or cryogens, and therefore is not usually considered a type of chemical explosion. However, if the substance involved *is* flammable, it is likely that the resulting cloud of the substance will ignite after the BLEVE has occurred, forming a fireball and

possibly a fuel-air explosion, also termed a vapor cloud explosion (VCE). If the materials are toxic, a large area will be contaminated.[2]

http://en.wikipedia.org/wiki/Bleve (taken 01/26/2010) (footnotes and links omitted.)

THE OFFICE ACTION

In the Office Action of August 26, 2009 (herinafter referred to as "the Office Action" or "OA"), the Office asserted the following as grounds for objection

1. "Claims 1-15 are objected to because of... informalities [with respect to the recitation of units of temperature]." (OA, ¶1)

and the following as grounds for rejection

2. "Claims 1-15 are rejected under 35 U.S.C. 112. second paragraph, as being indefinite; (OA, ¶¶2-5)
3. "Claims 1-2. 4-6, 8-10. & 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gass (U.S. Patent No. 5.000.336) (hereinafter "Gass") (OA, ¶¶7-20);
4. "Claims 1-2. 4-6, 8-10. & 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gass (U.S. Patent No. 5,000.336) (hereinafter "Gass") and further in view of Alhamad

(U.S. Patent No. 5,794,706) (hereinafter "Alhamad")" (OA, ¶¶21-23);

5. "Claims 3. 7. & 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gass (U.S. Patent No. 5.000.336) (hereinafter "Gass") as applied to claims 1, 5, & 9 above, and further in view of Mondt et al. (U.S. Patent No. 5,246,130) (hereinafter "Mondt")" (OA, ¶¶24-28); and

6. Claims 4, 8, & 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gass (U.S. Patent No. 5,000,336) (hereinafter "Gass") as applied to claims 1. 5, & 9 above, and further in view of Szego (U.S. Patent No. 3.356,256) (hereinafter "Szego"). (OA, ¶¶29-33)

The Office Action is non-final. (*See, page 2 (Form PTOL-326) at item 2b.*)

THE OBJECTIONS TO THE CLAIMS (OA, ¶1)

The Office asserts that

> "Regarding claims 1, 5, 9, and 13-15, the heat conductivity does not have any units of temperature (°C or K. most likely)."

(The remaining claims (2-4. 6-8, & 10-12) are objected to as they are dependent on claims I. 5, or 9.)

Applicant submits that the appropriate units of head conductivity are as stated in the claims.

> For general scientific use, *thermal conductance* is the quantity of heat that passes in unit time through a plate of *particular area and thickness* when its opposite faces differ in temperature by one kelvin.
>
> http://en.wikipedia.org/wiki/Heat_conductivity#Conductance
>
> (taken 01/25/2010)

In this definition temperature is not part of the unit of measure.

THE INDEFINITENESS REJECTION (OA, ¶¶2-5)

The Office asserts

> "Regarding claims 1, 5, 9, and 13-15, how the relation of surface area per unit volume of the application and the contact surface of the flammable fluids contained in the containing vessel is indefinite. What is claimed is a ratio of area per unit volume to total surface area. This gives a ratio with units of l/volume."
>
> (OA, ¶4)

This statement misconstrues the language recited in the claims. The construction of this claim language is discussed below under the obviousness rejection.

Further, the Office asserts

"Also the definition of "unit" in "unit volume" was never established. Is it cubed meters, centimeters, feet, or possibly more abstract?"

(OA, ¶4)

The term "unit volume" may be appropriately described as follows

"**Unit Volume**

Sometimes we are looking at objects and we need to ask very fundamental questions. We might not be necessarily interested in how much total space the thing occupies. We might be looking at a part of it, or we might be asking questions such as "how many atoms are there in 1 cm^3 of the atmosphere of planet Z"? In such cases we are not asking something about the whole object but only part of the object, or something that we believe - in some approximation - to be a fundamental question to ask about the object.

For this reason we define the notion of **unit volume**. The notion of unit volume is very geometrical and "abstract", but at the same time it is an exteremely simple idea. When we look at a unit volume inside an object we imagine some arbitrary sized cube that is *much smaller* than the size of the object, but large enough to contain a sufficient "sample" of the object."

http://lasp.colorado.edu/~bagenal/MATH/supplement/density.html

(taken 01/25/2010)

An illustrative example might be as follows:

"The *density* of an object is defined as mass per unit volume."

http://en.wikipedia.org/wiki/Volume (taken 01/25/2010)

THE OBVIOUSNESS REJECTIONS (OA, ¶ 6-33)

Gass

Gass has been cited and applied to all claims either as the sole citation (OA, ¶¶7-20) or as the primary citation in combination with one of the other citations as a secondary citation (OA, ¶¶21-33).

A recitation of each of the independent claims 1, 5, 9, and 13-15 is a sheet material comprising

"a surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel"

or words to that effect.

The Office concedes that Gass does not disclose this recitation

"Gass does not teach a surface area per unit volume of application of at least about 2.000 times the contact surface of flammable fluids contained in a containing vessel… ."

(OA, ¶7)

> "Although a large area for heat dissipation is desired, Gass does not teach surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel."
>
> (OA, ¶22)

Clearly, Gass does not teach this claim recitation and the Office concedes that. The Office attempts to close this gap by asserting "Gass also teaches that a high surface area in comparison to the amount of fluid contained in the vessel and container volume (contact surface of the flammable fluids in a containing vessel)… ." (OA, 10.) However, this assertion misses the mark. Applicant has recognized the importance of correlating

> (a) the surface area per unit volume of sheet material applied
>
> with
>
> (b) contact surface area of the fluid material in the containing vessel.

The assertion by the Office speaks only to "the amount of fluid contained" and the "container volume." In other words, the Office is asserting a relationship with volume whereas the claim recitation is a relationship with surface. Thus, the position by the Office on obviousness over Gass fails and, in fact, argues in favor of patentability over Gass on this point alone.

Alhamad

The Office also asserts that 1-2, 4-6, 8-10, and 12-15 are obvious over Gass in view of Alhamad. Gass has been discussed above. It does not provide adequate disclosure to act as a primary citation for combination with Alhamad. Alhamad also does not provide relevant disclosure.

The Office asserts

> "Alhamad teaches an explosion-inhibiting article (abstract) that has a surface area per unit volume of 250 to 325 ft^2 per ft^3 (8.2 - 10.7 m^2/m^3) (col. 6, lines 50-51). Although this is not taught in relation to a contact surface of flammable fluids contained in a spherical containing vessel (the inner surface of the vessel), one could imagine a vessel that has a surface area of 0.1625 ft". which is 2,000 times smaller than 325 ft^2 per ft^3. Gass doe calculate the volume percentage of the container that their explosion-inhibiting articles consume to be 2-3% (col. 5. lines 46-50) so a relation between the surface area of the container to the surface area per unit volume of the article would not be outside the reach of one of ordinary skill in the art. It would have been obvious to one of ordinary skill in the art at the time of invention to develop a surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel."
>
> (OA, ¶23)

This assertion is erroneous i three resects. First, it is an after the fact, hindsight, reconstruction based on Applicant's own disclosure of the relationship in the claim recitation. The Office has not been able to point to any derivation of that relationship in the prior art. Secondly, the Office is not using the correct, and relevant, surface area in the container. The Office is asserting with respect to the surface area of the container. Applicant is reciting in the claims the contact surface. Applicant discloses that concept, *inter alia*, as follows:

> "[0058]The expanded, apertured sheet material 20 desirably has an effective surface area per unit volume from at least about 2,000 times the contact surface of flammable liquid/vapors and gases contained in closed containers, particularly for inhibiting boiling liquid, expanding vapor explosions, and preferably from at least about 3,000 times the contact surface of flammable liquid/vapors and gases contained in closed containers. The term "contact surface" refers to the surface area of the containment vessel that is in contact with the gaseous, aerosol or vapor phase of the flammable fluid that is contained in the containment vessel. Normally the flammable fluids (liquid, vapor, aerosol or gas) are in contact with the surface areas of the walls of the container containing the flammable fluid.

Thirdly, the Office's assertion requires the creation of a hypothetical that has no basis in the disclosure of Alhamad, namely "one could imagine a vessel that has a surface area of 0.1625

ft"." (Emphasis supplied.) Consequently, the Office's assertion is not supported by Alhamad itself and Alhamad fails as a secondary citation on obviousness.

Mondt et al.

Mondt does not remedy the deficiencies of either Gass or Alhamad.

Szego

The Office asserts

> Szego teaches that the material should be stiff and should strongly resist crushing and compression... ."
>
> (OA, 31)

This assertion is inapplicable since it speaks to resistance to compression and not to compressive yield.

Further, Szego does not remedy the deficiencies of Gass and Alhamad.

CONCLUSION

In view of the foregoing remarks, Applicant respectfully requests reconsideration of the application and its allowance.

Respectfully submitted,

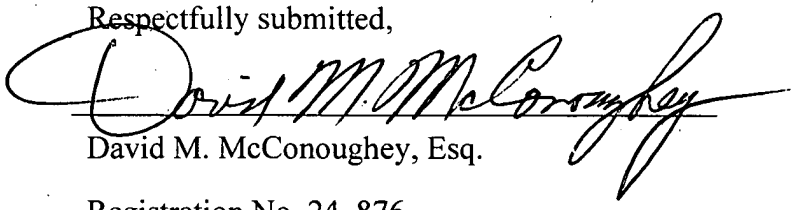


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EXHIBIT A

1. (original) An explosion-inhibiting article of manufacture comprising an apertured sheet material, said sheet material

a. being provided with at least one row of a plurality of polygonal apertures, at least one of said polygonal apertures being irregular with respect to at least one adjacent polygonal aperture, and

b. having physical characteristics comprising

i. a surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel, and

ii. a heat conductivity of at least about 0.025 Cal/cm-sec.

2. (original) An explosion-inhibiting article of manufacture in accordance with claim 1, wherein the inner peripheral length of at least one of said apertures is unequal to the inner peripheral length of at least one adjacent aperture.

3. (original) An explosion-inhibiting article of manufacture in accordance with claim 1, wherein the material has a density from about 2.8 g/cm^3 to about 19.5 g/cm^3.

4. (original) An explosion-inhibiting article of manufacture in accordance with claim 1, wherein said article has a compressive yield of not more than about 10 percent.

5. (original) An explosion-inhibiting article of manufacture having a generally spheroidal shape and comprising an apertured sheet material, said sheet material

a. being provided with at least one row of a plurality of polygonal apertures, at least one of said polygonal apertures being irregular with respect to at least one adjacent polygonal aperture, and

b. having physical characteristics comprising

i. a surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel, and

ii. a heat conductivity of at least about 0.025 Cal/cm-sec.

6. (original) An explosion-inhibiting article of manufacture in accordance with claim 5, wherein the inner peripheral length of at least one of said apertures is unequal to the inner peripheral length of at least one adjacent aperture.

7. (original) An explosion-inhibiting article of manufacture in accordance with claim 5, wherein the material has a density from about 2.8 g/cm^3 to about 19.5 g/cm^3.

8. (original) An explosion-inhibiting article of manufacture in accordance with claim 5, wherein said article has a compressive yield of not more than about 10 percent.

9. (original) An explosion-inhibiting article of manufacture having a generally cylindrical shape and comprising an apertured sheet material, said sheet material

a. being provided with at least one row of a plurality of polygonal apertures, at least one of said polygonal apertures being irregular with respect to at least one adjacent polygonal aperture, and

b. having physical characteristics comprising

i. a surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel, and

ii. a heat conductivity of at least about 0.025 Cal/cm-sec.

10. (original) An explosion-inhibiting article of manufacture in accordance with claim 9, wherein the inner peripheral length of at least one of said apertures is unequal to the inner peripheral length of at least one adjacent aperture.

11. (original) An explosion-inhibiting article of manufacture in accordance with claim 9, wherein the material has a density from about 2.8 g/cm^3 to about 19.5 g/cm^3.

12. (original) An explosion-inhibiting article of manufacture in accordance with claim 9, wherein said article has a compressive yield of not more than about 10 percent.

13. (original) An explosion-inhibiting article of manufacture comprising an apertured sheet material, said sheet material

a. being provided with at least one row of a plurality of polygonal apertures, and

b. having physical characteristics comprising

i. a surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel, and

ii. a heat conductivity of at least about 0.025 Cal/cm-sec,said article having a compressive yield of not more than about 10 percent.

14. (original) An explosion-inhibiting article of manufacture having a generally spheroidal shape and comprising an apertured sheet material, said sheet material

a. being provided with at least one row of a plurality of polygonal apertures, and

b. having physical characteristics comprising

i. a surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel, and

ii. a heat conductivity of at least about 0.025 Cal/cm-sec, said article having a compressive yield of not more than about 10 percent.

15. (original) An explosion-inhibiting article of manufacture having a generally cylindrical shape and comprising an apertured sheet material, said sheet material

a. being provided with at least one row of a plurality of polygonal apertures, and

b. having physical characteristics comprising

i. a surface area per unit volume of application of at least about 2,000 times the contact surface of flammable fluids contained in a containing vessel, and

ii. a heat conductivity of at least about 0.025 Cal/cm-sec,said article having a compressive yield of not more than about 10 percent.